UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 36504

CR NO. 98

OVER THE

RAT ROOT RIVER

DISTRICT 1 - KOOCHICHING COUNTY

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 16)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 36504, Piers 1 through 4, were found to be generally in good, sound, and firm (material integrity) condition with no defects of structural significance observed. The minor checking, random surface splintering, and delamination on the piles has progressed since the previous inspection, but overall, has still not appreciably compromised pile capacity or structural integrity. The lateral stability of the piers, however, has been somewhat compromised as a result of the bracing deficiencies encountered. The channel bottom around the substructure units is currently stable with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

(A) All piles exhibited widespread minor checking up to 1/4 inch wide, and random minor surface splintering and delamination immediately above and below the waterline.

(B) Random braces on all piers were broken or split through the pile connections. In their present condition, these braces are not contributing to the lateral stability of the structure.

(C) Deterioration and a 50 percent loss of section was observed at the east end of the Pier 2 pile cap, which has reduced the cap's bearing capacity by approximately 50% on the easternmost pile.

(D) Light to moderate accumulations of timber debris were observed along all of the piers.

(E) The replacement steel channel cross bracing was deformed, and was disconnected from two of the timber piles at Pier 2.

RECOMMENDATIONS:

(A) Monitor drift for increases in amount of accumulation during future inspections, and if found to becoming excessive, removal may be warranted at that time.

(B) Replace the damaged and disconnected timber cross bracing and repair the disconnected steel channel cross bracing to improve and/or restore the lateral stability of the bridge.

(C) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Daniel G. Stromberg

Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.

Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 36504

Feature Crossed: The Rat Root River

Feature Carried: CR No. 98

Location: District 1 - Koochiching County

Bridge Description: The bridge superstructure consists of five spans of timber deck and stringers. The superstructure is supported by four timber pile piers and two timber pile abutments. The four piers are designated as Piers 1 through 4 starting from the south end of the bridge.

2. INSPECTION DATA

Professional Engineer Diver: Daniel G. Stromberg, P.E., S.E.

Dive Team: John Loftus, Valerie Roustan

Date: August 26, 2007

Weather Conditions: Sunny, 50^{o} F

Underwater Visibility: 1.0 foot

Waterway Velocity: 0.5 fps

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 4 and the North and South Abutments.

General Shape: Each of the piers consists of a single row of six timber piles under a common cap with timber and steel channel cross bracing between the piles. The abutments and their skewed wingwalls are constructed of horizontal timber planking retained in place by a single row of six piles along the abutment breastwall (with cap) and wingwalls (two piles).

Maximum Water Depth at Substructure Inspected: Approximately 7.8 feet

4. WATERLINE DATUM

Water Level Reference: The top of the pier cap on the west end of the South Abutment.

Water Surface: The waterline was approximately 6.9 feet below reference. Waterline Elevation = 1107.1.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 7

Item 92B: Underwater Inspection: Code B/08/07

Item 113: Scour Critical Bridges: Code K/95

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

_____ Yes X No

Photograph 1. Overall View of Structure, Looking Southwest.

Photograph 2. View of Pier 1, Looking Southeast.

Photograph 3. View of Pier 2, Looking Southeast.

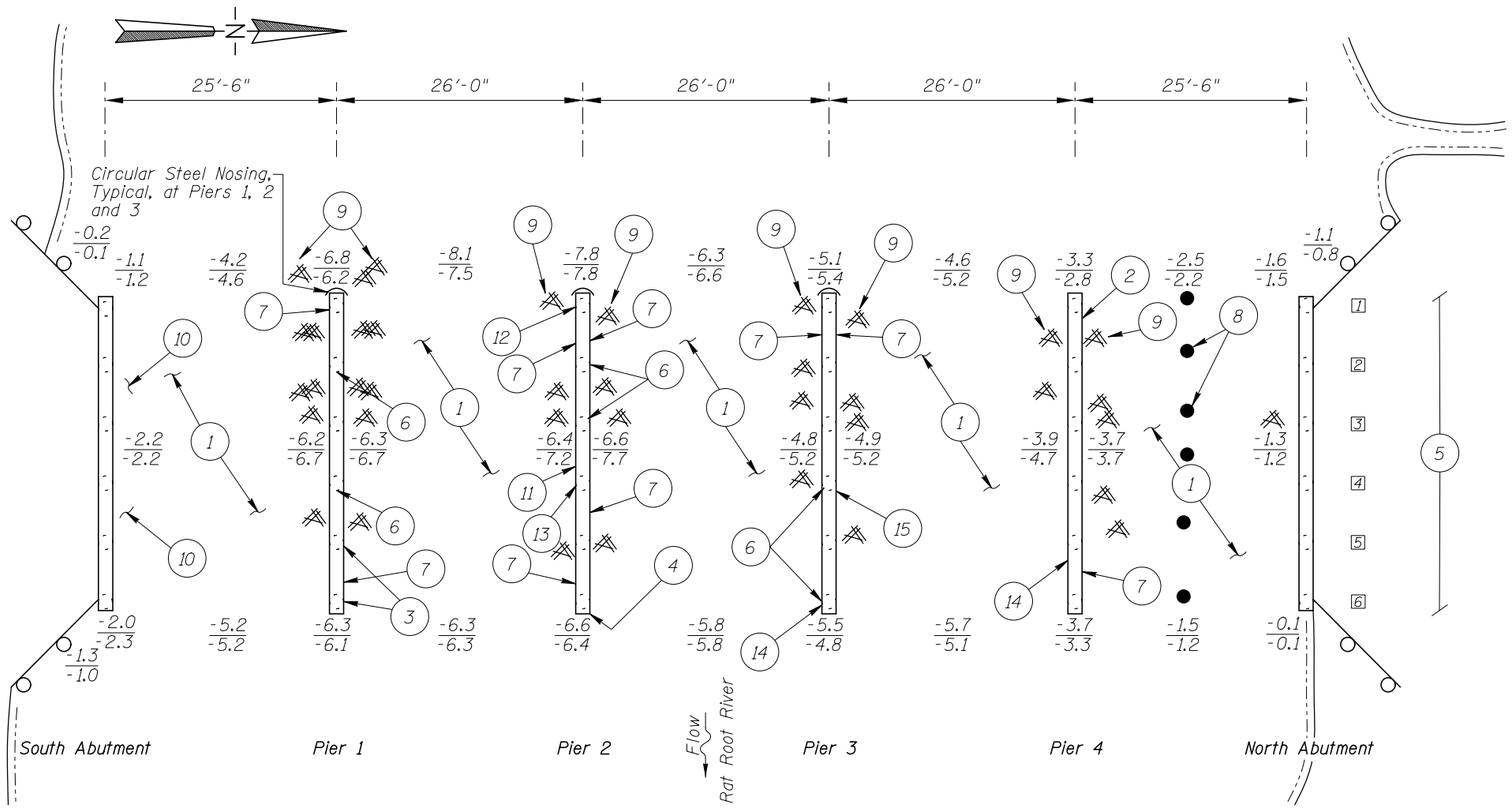
Photograph 4. View of Pier 3, Looking Southeast.

Photograph 5. View of Pier 4, Looking Southeast.

Photograph 6. View of the North Abutment, Looking Northwest.

Photograph 7. View of the South Abutment, Looking Southeast.

Photograph 8. View of Pile Cap not Bearing Fully on the Downstream Pile of Pier 2, Looking South.



SOUNDING PLAN

GENERAL NOTES:

1. Piers 1 through 4 and the South and North Abutments were inspected at this bridge.
2. At the time of inspection on August 26, 2007, the waterline was located 6.9 feet below the top of the west end of the South Abutment. This corresponds to a waterline elevation of 1107.1 based on design drawings.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at mid point intervals between the substructure units.

Note:

All soundings based on 2007 waterline location.

TYPICAL END VIEW OF PIERS

INSPECTION NOTES:

(1) The channel bottom material around all of the piers typically consisted of silty clay with a maximum probe rod penetrations of 1 foot.

(2) Bracing split over length of 10 feet and separated through pile fastener.

(3) Outer layer of pile softer than typical with approximately 1 inch surface delamination from 3 feet above the waterline to the channel bottom. (ice related damage)

(4) End of cap at above the easternmost pile has a 50 percent loss of section, that has reduced the cap's bearing capacity on the pile by 50%. The pile seems to have shifted downstream.

(5) All of the timber piles around the waterline and below exhibited random 1/4 inch soft outer layer with checking and delamination due to normal weathering, age, and ice damage. Random 1/4 inch wide checking was also present at most piles.

(6) Heavier surface splintering and delamination, as noted in Note 5, typically extending between 1 foot below and 4 feet below the waterline with penetration/depth of 1/2 inch.

(7) Steel channel replacement cross bracing was used to replace the old timber cross bracing on the upstream south side and downstream north side of Pier 1, all of the timber cross bracing at Pier 2, and on the upstream north and south sides of Pier 3.

(8) Old abandoned timber piles that were protruding 2 to 4 feet above the mudline.

(9) Light timber debris consisting of branches up to 6 inches in diameter. Most of the debris extended from the channel bottom to 1 to 3 feet above the channel bottom.

(10) The channel bottom at the South Abutment consisted of gravel and 1 foot diameter riprap.

(11) The steel channel was deformed between the 3rd and 4th pile in from the upstream fascia, and was not engaged to the 4th pile in from the upstream fascia.

(12) The steel channel was no longer engaged to the upstream pile and had been deformed by ice flow and drift.

(13) The timber pile exhibited a 3 inch diameter, with 1 inch penetration, area of abrasion that was caused by rubbing contact with the unconnected steel channel, and was located 1-1/2 feet below the waterline.

(14) Timber cross bracing was no longer in place.

(15) A 6 feet long by 2 inch wide split in timber bracing through the pile fastener.

Legend

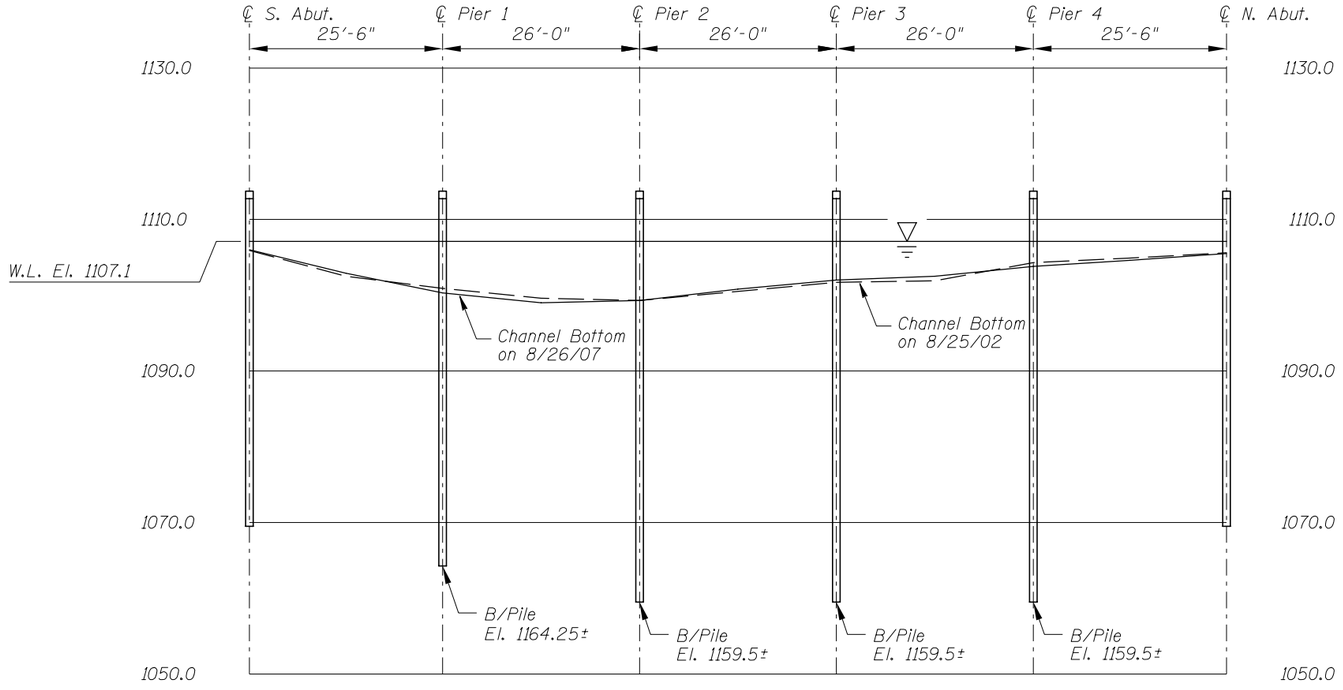
-5.5	Sounding Depth from Waterline (8/26/07)
-5.7	Sounding Depth from Waterline (8/25/02)
○	Timber Pile
◌	Timber Pile
●	Old Abandoned Timber Pile
	Timber Debris

MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

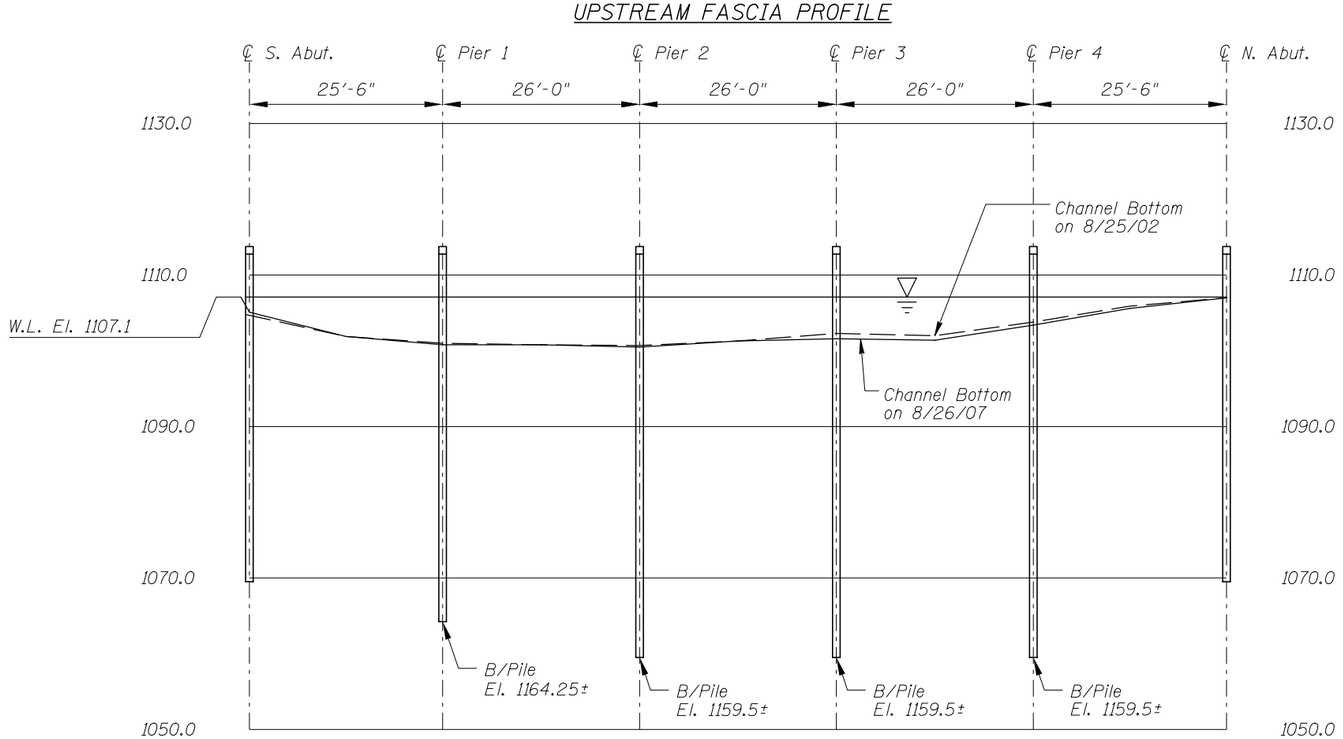
STRUCTURE NO. 36504
OVER THE RAT ROOT RIVER
DISTRICT 1, KOOCHICHING COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: LJ	COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, Il. 60606 (312) 704-9300 www.collinsengr.com	Date: AUG. 2007
Checked By: DGS		Scale: NTS
Code: 52210016		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:

Refer to Figure 1 for General Notes.

MINNESOTA
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UNDERWATER BRIDGE INSPECTION

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UPSTREAM AND DOWNSTREAM FASCIA PROFILES

Drawn By: LJ	COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	Date: AUG. 2007
Checked By: DGS		Scale: 1"=20'
Code: 52210016		Figure No.: 2

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 26, 2007
ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E., S.E.
BRIDGE NO: 36504 WEATHER: Sunny, 50 ^{o} F
WATERWAY CROSSED: The Rat Root River
DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR
_____ OTHER
PERSONNEL: John Loftus, Valerie Roustan
EQUIPMENT: SCUBA, U/W Light, Scraper, Lead Line, Probe Rod, Camera
TIME IN WATER: 2;30 P.M
TIME OUT OF WATER: 3:00 P.M.
WATERWAY DATA: VELOCITY 0.5 fps
VISIBILITY 1.0 feet
DEPTH 7.8 feet maximum at Pier 2
ELEMENTS INSPECTED: South and North Abutments and Piers 1 through 4.
REMARKS: Overall, the timber piles and planking (of abutment backwall/wingwalls) were in good, sound, and firm condition below water, although all piles exhibited widespread, up to 1/4 inch wide checking, and random minor surface (1/4 inch deep) splintering and delaminating. A few piles exhibited more extensive surface (1/2 inch deep) splintering, delaminating, and section loss related to ice-abrasion damage. All piers have light to moderate timber drift along and around the piles, especially around the upstream piles. Split timber cross bracing noted in previous inspections have been replaced with steel channels. At Pier 2, the steel channel bracing is no longer engaged at the north side of the upstream pile, and the south side of the 4th pile from the upstream fascia. Both steel members at the upstream end of Pier 2 exhibited deformation due to ice-damage. Some of the remaining timber cross bracing exhibited splitting through the pile fasteners, with splits extending up to 10 feet in length.

FURTHER ACTION NEEDED: X YES _____ NO

Monitor drift for increases in amount of accumulation during future inspections, and if found to becoming excessive, removal will be warranted at that time

Replace the damaged and disconnected timber cross bracing and repair the disconnected steel channel cross bracing.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 36504
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED The Rat Root River

INSPECTION DATE August 26, 2007

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

			SUBSTRUCTURE						CHANNEL					GENERAL					
UNIT REFERENCE NO.		MAXIMUM DEPTH OF WATER	PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER (BRACING)	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
	UNIT DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	North Abutment	1.3’	7	N	N	9	8	7	8	8	8	N	8	N	N	7	N	N	N
	Pier 4	3.9’	7	N	N	9	5	5	8	N	N	7	7	N	N	7	N	N	N
	Pier 3	5.5’	7	N	N	9	6	6	8	N	N	7	7	N	N	7	N	N	N
	Pier 2	7.8’	7	N	N	7	5	5	8	N	N	7	7	N	N	7	N	N	N

*UNDERWATER PORTION ONLY

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NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 36504
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED The Rat Root River

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UNIT REFERENCE NO.		MAXIMUM DEPTH OF WATER	PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER (BRACING)	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
	UNIT DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Pier 1	6.8’	7	N	N	9	6	6	8	N	N	7	7	N	N	7	N	N	N
	South Abutment	2.2’	7	N	N	9	8	7	8	8	8	N	8	N	N	7	N	N	N

*UNDERWATER PORTION ONLY

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